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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,924	06/26/2003	Pieter van Rooyen	RONI-012/01US (186980-202	3857

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EXAMINER
AHN, SAM K

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/606,924	ROOYEN ET AL.	
	Examiner	Art Unit	
	Sam K. Ahn	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05/09/07*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☒ Claim(s) *18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see p.7, filed 05/09/07, with respect to the rejection(s) of claim(s) 1-6,9-11 and 13-17 under 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Alamouti et al. US 6,501,803 (Alamouti).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4,6,9-11 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti et al. US 6,501,803 (Alamouti) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri).

Regarding claims 1,6 and 13, Alamouti discloses a method and an apparatus for transmitting a signal from a plurality of antennas (see 31 and 32 in Fig.1) comprising: an outer encoder or channel encoding means (element 10) configured to encode a stream of data according to a turbo multiple trellis coded modulation scheme (note col.4, lines 15-16), thereby generating a plurality of channel-coded symbol streams (generating $M(s_0, s_i)$ and $M(s_1, s_i)$; an inner

encoder or space encoding means (20) configured to receive the plurality of channel-coded symbol streams (element 20 receiving $M(s_0, s_i)$ and $M(s_1, s_i)$ from element 10) and provide space coding (note c.3, l.10) to the plurality of channel-coded symbol streams, thereby generating a plurality of space-channel-coded symbol streams (output of element 20); and a plurality of antennas (31,32) coupled to the inner encoder, wherein each of the plurality of antennas is configured to transmit one of the plurality of space-channel-coded symbol streams (note c.3, l.20-28).

However, Alamouti does not explicitly teach wherein the inner encoder is a space time encoding means providing space time encoding.

Seshadri discloses, in the same field of endeavor, an inner core or space-time encoding means (32) configured to provide space-time coding to the plurality of channel-coded symbol streams, thereby generating a plurality of space-time-channel-coded symbol streams (note col2, lines 37-39); and a plurality of antennas (33,34) coupled to the inner encoder, wherein each of the plurality of antennas is configured to transmit one of the plurality of space-time-channel-coded symbol streams. Seshadri further teaches that space time encoding has orthogonal structures to enable use of a simple decoding algorithm by decoupling of the signals transmitted from the different antennas, and to achieve maximum possible diversity (note c.1, l.52-57). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate the teaching of Seshadri in the system of Alamouti by implementing space time

encoding in the inner encoder of Alamouti for the purpose of providing orthogonal structures to enable use of a simple decoding algorithm by decoupling of the signals transmitted from the different antennas, and to achieve maximum possible diversity (note c.1, l.52-57).

Regarding claims 2,3,9,10,14 and 15, Seshadri further teaches wherein the space-time encoding includes block space-time coding (note col,4, lines 7-10 and 32-33) and convolutional space-time coding (note col.5, lines 27-38).

Regarding claims 4 and 11, Seshadri further teaches wherein the encoding the streams of data includes maximizing a coding gain (note col.1, line 60 - col.2, line 3) and the space-time encoding includes maximizing diversity gain (note col.1, lines 54-57).

Regarding claims 16 and 17, Alamouti discloses a method and an apparatus for transmitting a signal from a plurality of antennas (see 31 and 32 in Fig.1) comprising: an outer encoder or channel encoding means (element 10) configured to encode a stream of data according to a turbo multiple trellis coded modulation scheme (note col.4, lines 15-16), thereby generating a plurality of channel-coded symbol streams (generating $M(s_0, s_i)$ and $M(s_1, s_i)$; an inner encoder or space encoding means (20) configured to receive the plurality of channel-coded symbol streams (element 20 receiving $M(s_0, s_i)$ and $M(s_1, s_i)$ from

element 10) and provide space coding (note c.3, l.10) to the plurality of channel-coded symbol streams, thereby generating a plurality of space-channel-coded symbol streams (output of element 20); and a plurality of antennas (31,32) coupled to the inner encoder, wherein each of the plurality of antennas is configured to transmit one of the plurality of space-channel-coded symbol streams (note c.3, l.20-28).

However, Alamouti does not explicitly teach wherein the inner encoder is a space time encoding.means providing space time encoding.

Seshadri discloses, in the same field of endeavor, an inner core or space-time encoding means (32) configured to provide space-time coding to the plurality of channel-coded symbol streams, thereby generating a plurality of space-time-channel-coded symbol streams (note col2, lines 37-39); and a plurality of antennas (33,34) coupled to the inner encoder, wherein each of the plurality of antennas is configured to transmit one of the plurality of space-time-channel-coded symbol streams.

Seshadri further discloses a method and an apparatus of a transceiver comprising a transmitter portion including: an outer encoder or channel encoding means (31) configured to encode a stream of data according to a turbo multiple trellis coded modulation scheme (note col.2, lines 35-37), thereby generating a plurality of channel-coded symbol streams; an inner core or space-time encoding means (32) configured to receive the plurality of channel-coded symbol streams and provide space-time coding to the plurality of channel-coded symbol streams,

thereby generating a plurality of space-time-channel-coded symbol streams (note col2, lines 37-39); and a plurality of antennas (33,34) coupled to the inner encoder, wherein each of the plurality of antennas is configured to transmit one of the plurality of space-time-channel-coded symbol streams. Seshadri further discloses a receiving portion comprising: at least one antenna (23,24) for receiving a plurality of transmitted space-time-channel-coded symbol streams, thereby generating a plurality of received space-time-channel-coded symbol streams; space-time decoder (21) coupled to the at least one antenna, wherein the space-time decoder is configured to decode the plurality of received space-time-channel-coded symbol streams, thereby generating at least one channel-coded symbol stream (note col.2, lines 38-39); and a channel decoder (22) configured to decode the at least one channel coded symbol stream, thereby generating a stream of received data. And although Seshadri does not explicitly teach the transmitter and receiver portions housed together, it is inherent since the teaching of Seshadri teaches a communication between a base station and a terminal unit, otherwise, there would only be a one way communication. Thus, in order to achieve two way communication, a transmitter and a receiver housed in one system is necessary. Seshadri further teaches that space time encoding has orthogonal structures to enable use of a simple decoding algorithm by decoupling of the signals transmitted from the different antennas, and to achieve maximum possible diversity (note c.1, l.52-57). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate the

teaching of Seshadri in the system of Alamouti by implementing space time encoding in the inner encoder of Alamouti for the purpose of providing orthogonal structures to enable use of a simple decoding algorithm by decoupling of the signals transmitted from the different antennas, and to achieve maximum possible diversity (note c.1, l.52-57).

3. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti et al. US 6,501,803 (Alamouti) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri) and Ling et al. US 2003/0043928 A1 (Ling).

Regarding claim 5, Alamouti in view of Seshadri teaches all subject matter claimed, as applied to claim 1, although Seshadri teaches wireless communication between two units (see Fig.1), does not explicitly disclose a communication protocol implemented.

Ling also teaches wireless communication between two units (see Fig.1) and further teaches communication protocols (CDMA, TDMA, OFDM,QPSK and QAM, note paragraphs 4-5). Therefore, it would have been obvious to one skilled in the art at the time of the invention to design using these communication protocols for the purpose of supporting well-known communication protocols, thus capable of adapting to currently existing systems in the market.

Regarding claim 7, although Alamouti in view of Seshadri teaches an outer encoder (31), Seshadri does not teach wherein the outer encoder includes a

plurality of parallel chains, wherein each of the coding chains includes a trellis coded modulation encoder, a block symbol interleaver and a QPSK mapper unit, wherein the plurality of coding chains generates the plurality of channel-coded symbol streams.

Ling teaches an outer encoder (712a~712k in Fig.7) including a trellis coded modulation encoder (note paragraphs 68 and 159), a block symbol interleaver (note paragraph 68) and a QPSK mapper unit (supporting QPSK, note paragraph 64), wherein the plurality of coding chains generates the plurality of channel-coded symbol streams. Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Seshadri's outer encoder with Ling's for the purpose of supporting plurality of channels for data and control (note paragraphs 130-131).

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable Alamouti et al. US 6,501,803 (Alamouti) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri) and Kapoor et al. USP 6,795,424 B1 (Kapoor).

Regarding claim 8, Alamouti in view of Seshadri teaches all subject matter claimed, as applied to claim 6. Although Alamouti and Seshadri teach plurality of antennas (33,34 in Fig.1), do not explicitly teach wherein the plurality of antennas are arranged so that the fading correlation between the antennas is below 0.5. Kapoor teaches plurality of antennas (see 52 in Fig.5) wherein the plurality of antennas are arranged so that the fading correlation between the antennas is

below 0.5 (note col.12, line 65 – col.13 line 4). Therefore, it would have been obvious to one skilled in the art at the time of the invention to arrange the plurality of antennas having fading correlation below 0.5 for the purpose of having almost perfect correlation, as taught by Kapoor.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable Alamouti et al. US 6,501,803 (Alamouti) in view of Seshadri et al. USP 6,584,593 B1 (Seshadri) and Scalise et al. USP 6,785,861 B2 (Scalise).

Regarding claim 12, Alamouti in view of Seshadri teaches all subject matter claimed, as applied to claim 6. Although Alamouti in view of Seshadri teaches an outer encoder (31) and inner encoder (32), does not teach and interleaver interposed between the outer encoder and the inner encoder.

Scalise teaches an interleaver (8 in Fig.3) receiving encoded data stream from an outer encoder (6) wherein it is further passed on to an inner encoder (8).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Seshadri's system to interpose the interleaver between the outer encoder and inner encoder, and having an inner decoder in the receiver, as taught by Scalise, for the purpose of improving communication between transmitter and receiver by detecting the errors (note col.6, lines 4-8).

Allowable Subject Matter

6. Claim 18 would be allowable if rewritten or amended to overcome the claim objections, set forth in this office action.

7. The following is a statement of reasons for the indication of allowable subject matter: Present application discloses a system comprising an outer encoder and an inner encoder and plurality of antennas for optimal transmission. Closest prior art, Seshadri teaches all subject matter claimed. However, Seshadri does not teach or suggest the combination of the limitations of a QPSK mapper, a first MTCM encoder and QPSK mapper unit, a first symbol selector and puncturer, a symbol interleaver, a second MTCM encoder and QPSK mapper unit, a symbol de-interleaver arrangement, a second symbol selector and puncturer, an inner encoder and a plurality of antennas configured as recited.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Ahn whose telephone number is (571) 272-3044. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sam K. Ahn
Patent Examiner

7/18/07